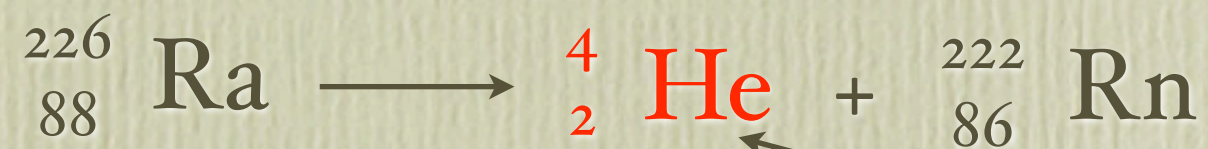


Nuclear Chemistry

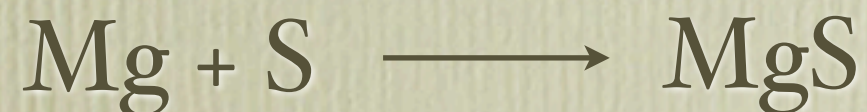
Nuclear reaction: particles and energy emitted from the nucleus of an atom. One atom of an element changes into an atom of a different element.

= nuclear transmutation:



← nuclear particle

Compare to a chemical reaction where electrons interact but the nuclei of atoms, and thus their identities, remain unchanged:

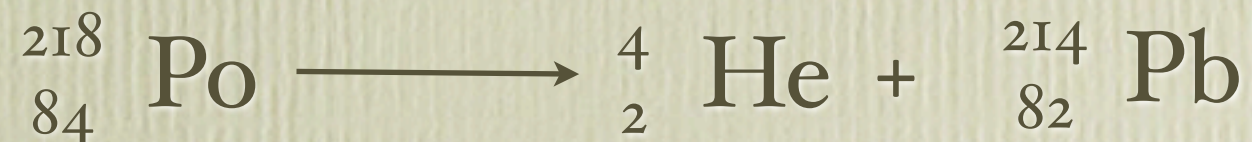
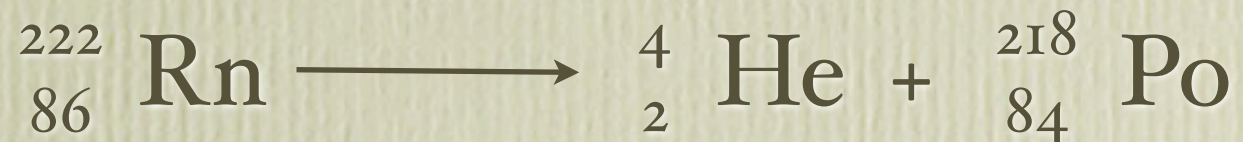


Why do nuclear reactions occur?

Some isotopes of atoms have nuclei that are unstable.

Beyond bismuth, all isotopes are unstable and therefore radioactive.

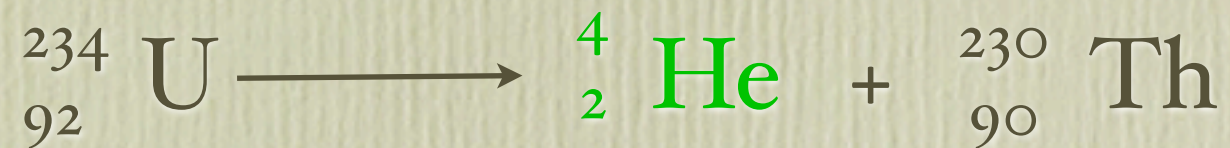
These isotopes undergo *spontaneous* radioactive decay (nuclear reaction) and transform into new elements that are more stable:



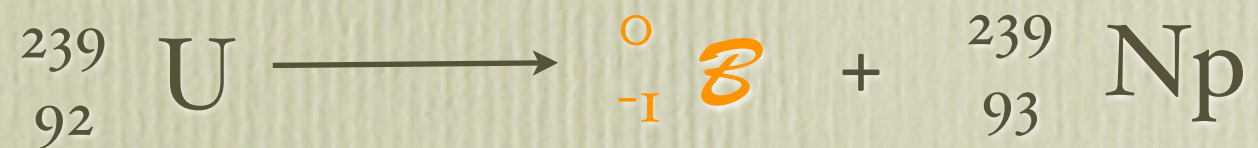
The above shows the transmutation of radon gas, which comes from the radioactive decay of uranium in rocks. Radon decays into polonium, and then into more stable lead-214.

Types of radioactive decay

Alpha: Emission of a helium nucleus
(2 protons and 2 neutrons).



Beta: Emission of an electron and proton

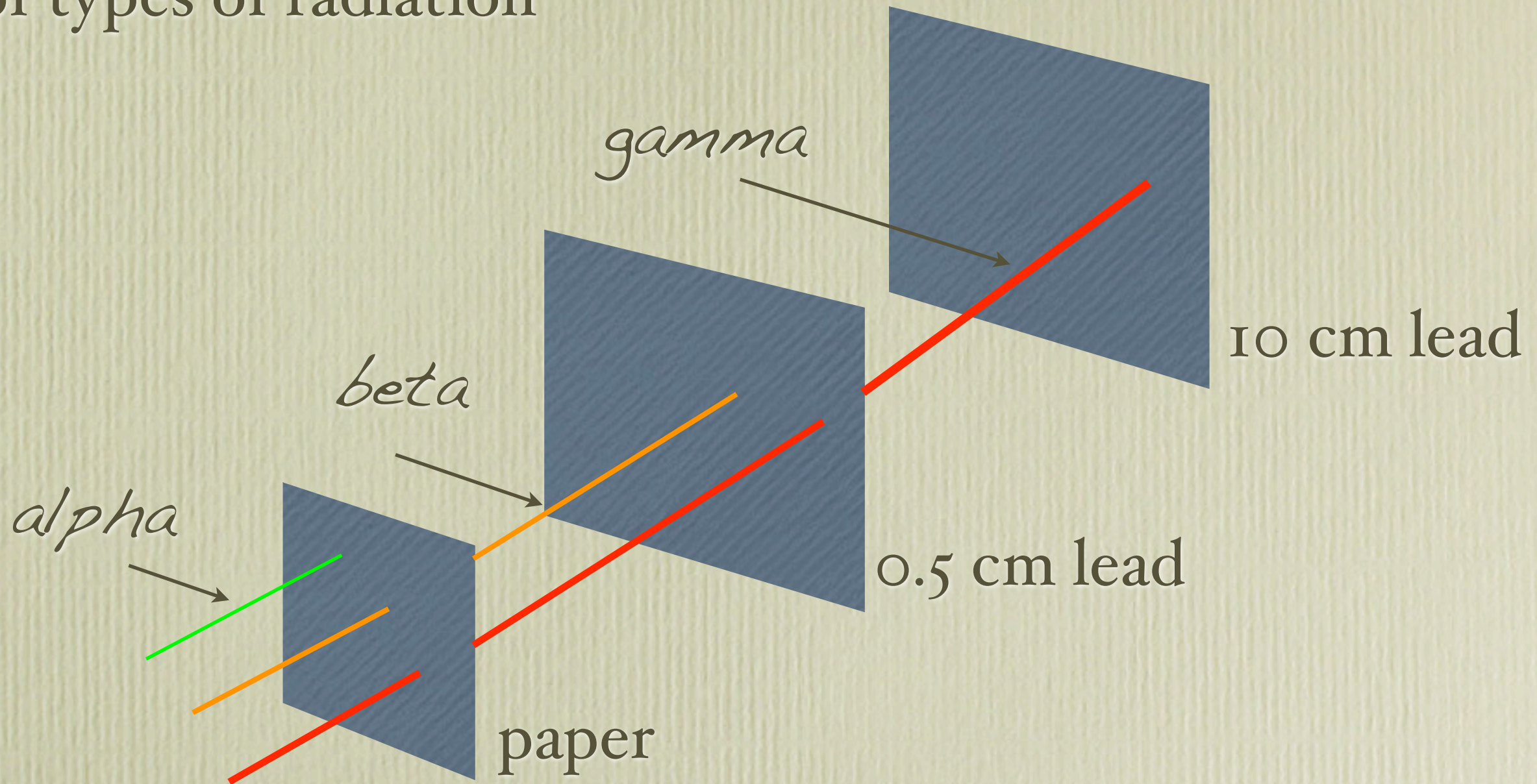


Gamma: Emission of high-energy
electromagnetic gamma rays
(no particles)

least
dangerous

most
dangerous

Penetrating power of types of radiation



Natural sources of radiation	Percentage
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Cosmic radiation	25.8
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The earth	24.2
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Building materials	1.5
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Inhaled from the air	2.6
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Elements in human tissue	10.8
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Subtotal	64.9
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Medical Sources	
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Diagnostic x-rays	25.8
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Radiotherapy	5.2
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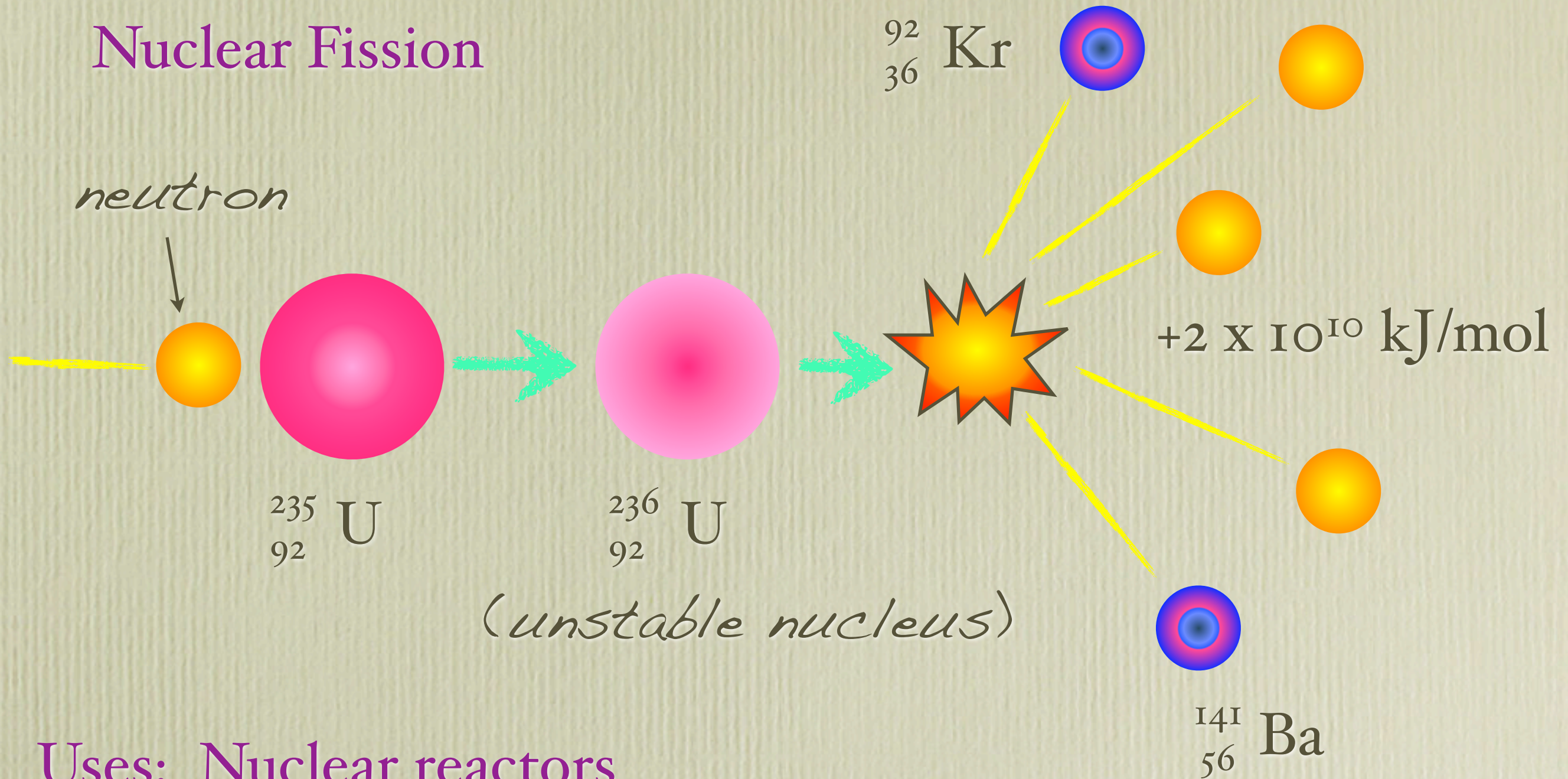
Internal diagnosis	0.5
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Subtotal	31.5
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Artificial sources: nuclear power, watch dials, nuclear test fallout	3.5
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Total	99.9
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Nuclear Fission



Uses: Nuclear reactors
Atomic bombs

Nuclear Fusion

